

Self-Help Energy Analysis for Your Plant



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Energy Analysis



⌘ No-cost, low-cost projects and resources:

- ☑ What you can do

- ☑ What you can expect of others

 - ☑ U.S. Dept. of Energy

 - ☑ Consultants

 - ☑ Vendors

 - ☑ Utilities

Background



⌘ Industrial Assessment Center (IAC) Program

- ☑ 440 assessments by A&M
- ☑ 60% project implementation rate
- ☑ Implemented savings average \$26K/yr/plant
- ☑ Mostly no cost, low cost projects

Energy Assessments


How others can help

- ⌘ Take advantages of DOE Best Practices
- ⌘ DOE works with industry to identify plant-wide opportunities for energy savings and process efficiency



Energy Assessments

How others can help



⌘ DOE Best Practices Program includes

- ☑ New and emerging technology implementation, and tech transfer
- ☑ Plant assessments
- ☑ Software tools, clearinghouse, publications library, and database
- ☑ Showcases

⌘ <http://www.oit.doe.gov/bestpractices/>

Energy Assessments

How others can help




⌘ Examples of emerging technologies:

- ☒ Ultrasonic tank cleaning
- ☒ Methanol recovery from hydrogen peroxide
- ☒ Advanced turbine systems
- ☒ Advanced burner systems for emission control
- ☒ And many others--available at
 - ☒ <http://www.oit.doe.gov/chemicals/bp>
 - ☒ <http://www.oit.doe.gov/petroleum/bp>

Energy Assessments

How others can help



⌘ Downloadable software from Best Practices


- ☑ Motormaster +3.0*
- ☑ PSAT (Pumping System Assessment Tool)*
- ☑ Steam System Assessment Tool (SSAT 1.0.0)*
- ☑ Steam System Scoping Tool*
- ☑ Industrial insulation program 3E Plus*

*Download from

http://www.oit.doe.gov/bestpractices/software_tools

Energy Assessments

How others can help



⌘ Additional useful software tools available

☒ AirMaster+ (available via CD)

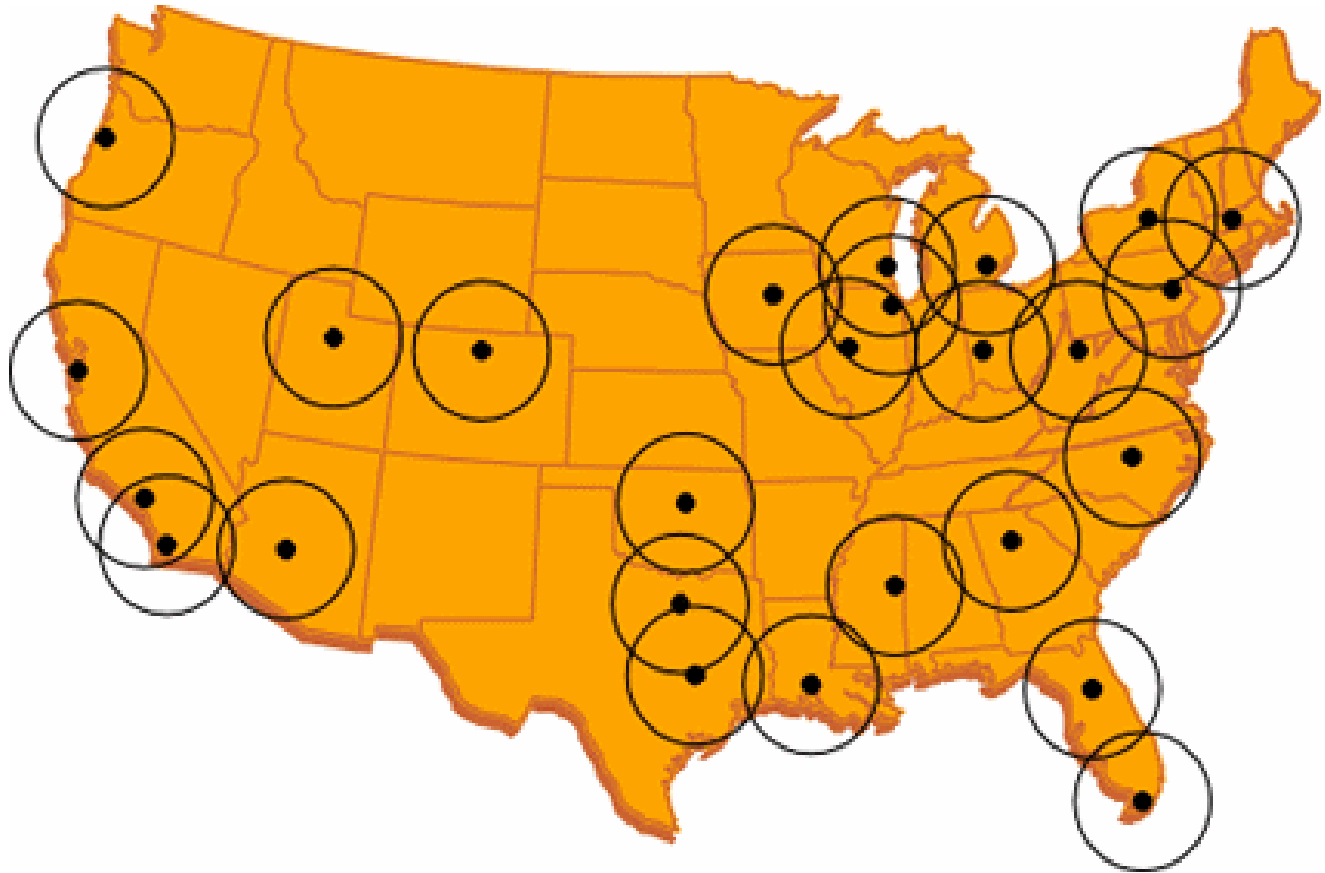
☒ ASDMaster (available via CD)

☒ Process Heating Assessment Tool (under development)

Energy Assessments

How others can help

- ⌘ Best Practices provides plant assessments
- ⌘ No-cost industrial assessments are available from centers around the nation



Energy Assessments

How others can help



- ⌘ Call a nearby IAC for a no-cost energy assessment if you meet 3 of 4:
 - ☑ Energy bills under \$2 million annually
 - ☑ Gross annual sales under \$100 million annually
 - ☑ Employees under 500
 - ☑ No-in house expertise for energy analysis

Energy Assessments

How others can help



⌘ Even if you don't meet 3 of 4--too large?--
we might be able to help

⌘ Locally, contact

✉ wheffington@mengr.tamu.edu

✉ jim@esl.tamu.edu

⌘ IAC national contact info:

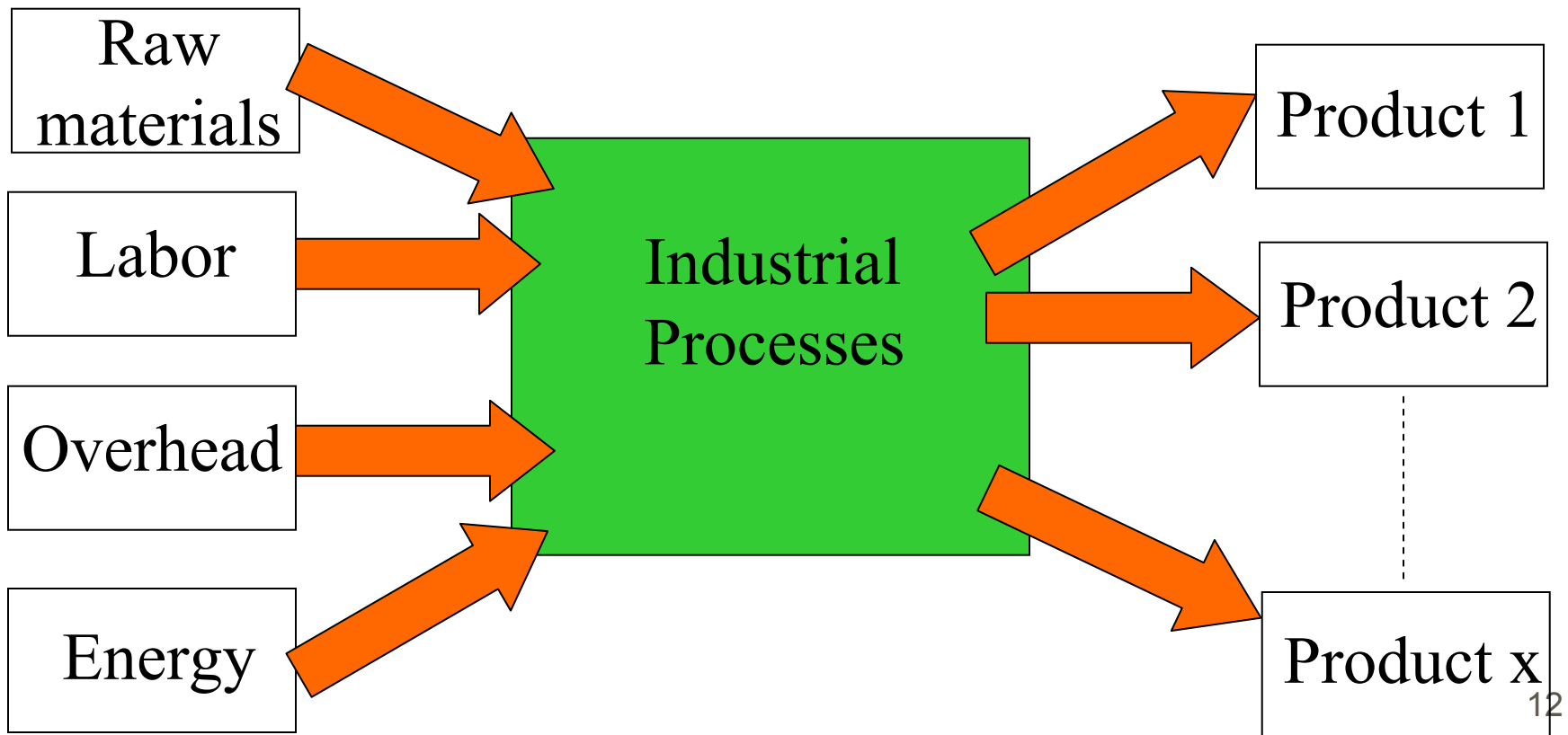
✉ <http://www.oit.doe.gov/bestpractices>

✉ <http://oipea-www.rutgers.edu>

Energy Assessments

What You Can Do

⌘ Looking at the forest is sometimes not too helpful



Energy Assessments

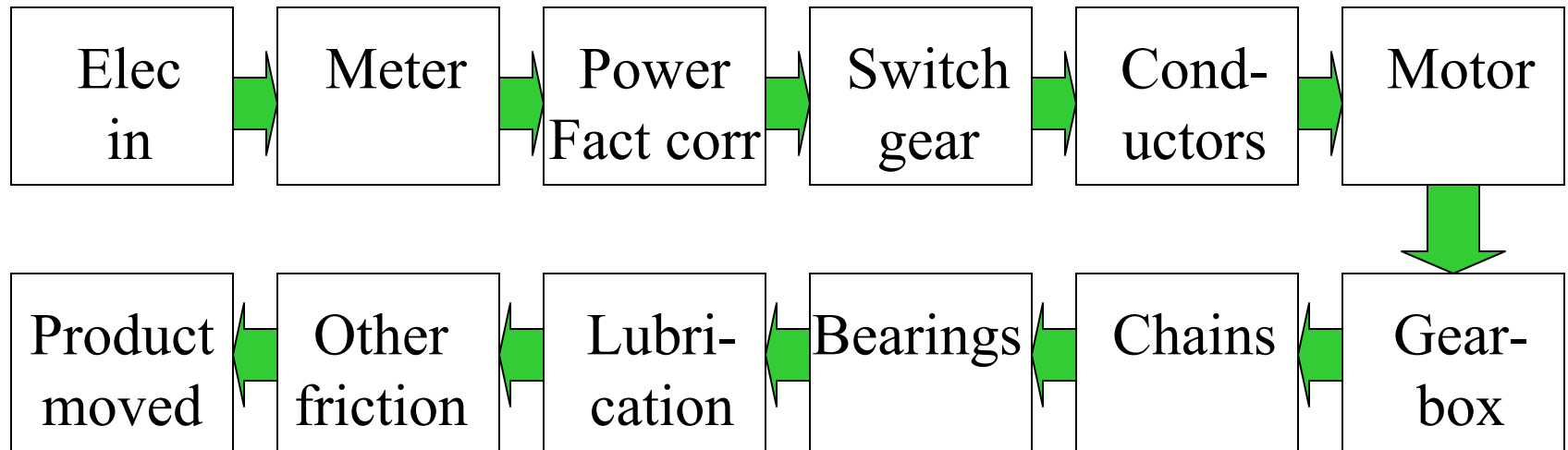
What You Can Do

- ⌘ Sometimes--just look at a few dying individual trees and treat them
- ⌘ However, it is a good idea to look at whole subsystems
 - ☐ process heating--not just product quality
 - ☐ electrical--not just motors
 - ☐ steam--not just steam traps
 - ☐ air--not just lack of air
 - ☐ water--not just the new wastewater treatment facility

Energy Assessments

What You Can Do

- ⌘ For example, consider the whole of the electric motor subsystem.
- ⌘ Problems can be costing \$\$ in any of these subparts, so look at everything together



Energy Assessments

What You Can Do



- ⌘ The Texas A&M IAC recently visited several refineries and chemical plants
- ⌘ Some projects are complex
 - ☑ replace natural gas fired engines
 - ☑ install flare gas compressor system
 - ☑ install variable frequency drives
 - ☑ install turbines
- ⌘ All require additional engineering

Energy Assessments

What You Can Do

⌘ Simple projects not requiring engr. assist.

- ☑ Repair steam traps

- ☑ Repair leaks--steam, water, air

- ☑ Turn off unused equipment and lights

- ☑ Repair insulation

- ☑ Use synthetic lubricants

- ☑ Use LEDs for exit lights where possible

⌘ List is from chemical plants and refineries

Energy Assessments

What You Can Do



⌘ Repair steam traps

- ⌘ Purchase an ultrasonic detector for about \$1,500 to \$5,000 and use it
- ⌘ Recommended 5 times in 8 large plants
- ⌘ Average savings \$300,000/yr
- ⌘ Payback less than a month

Energy Assessments

What You Can Do



Repair leaks

	# Projects	Avg Savings (\$/yr)	Simple Payback (yrs)
Steam	4	105,000	0.1
Nitrogen	1	140,000	0.4
Water	1	30,000	0.1
Air	2	2,000	0.5

Energy Assessments

What You Can Do

⌘ Turn off unused equipment

	# Projects	Avg Savings (\$/yr)
Motors	2	33,000
Lights	8	4,000

- ⌘ Implementation requires employee education and possibly switches or sensors
- ⌘ Obvious safety issues with lights

Energy Assessments

What You Can Do



⌘ **Repair/add missing insulation**

⌘ Recommended 3 times in 8 large plants

⌘ Saves \$24,000/yr

⌘ Payback usually a few months at most

Energy Assessments

What You Can Do



⌘ Use synthetic lubricants

⌘ Recommended 6 times in 8 large plants

⌘ Saves \$21,000/yr

⌘ Last longer but cost more, so the implementation cost turns out to be about the same as petroleum based lubes.

Energy Assessments

What You Can Do



- ⌘ **Install LEDs in exit lamps**
- ⌘ Great, small project
- ⌘ Saves energy, demand, supplies and labor
- ⌘ Big help to code compliance

Energy Assessments

What You Can Do



- ⌘ Consider performing your own assessment
- ⌘ Assistance available on web
- ⌘ http://oipea-www.rutgers.edu/documents/doc_m
 - ☑ Self-assessment workbook for small manufacturers
 - ☑ Modern industrial assessments: a training manual

Energy Assessments

What Others Can Do



⌘ Outside assistance

- ☑ Consultants--Tune-up specialists for the whole system or subsystems
- ☑ Vendors
- ☑ Utilities

Energy Assessments

What Others Can Do



- ⌘ Identify, quantify and report cost saving projects primarily related to energy.
- ⌘ Cost savings is key: some cost saving projects may not reduce energy consumption.
- ⌘ Pollution prevention benefit

Energy Assessments

Types of Energy Assessments

- ⌘ Screening or walk-through
- ⌘ Detailed
 - ☑ Low-cost, no-cost
 - ☑ Capital-intensive measures
- ⌘ Formal, expect documentation

Energy Assessments

What Others Can Do



- ⌘ Preliminary activities before the formal assessment of your system
- ⌘ Review 12 months (or more) historical data
 - ☑ Utility bills
 - ☑ Equipment logs
- ⌘ Review emissions data and attainment plan
- ⌘ Review capital expenditure plan
- ⌘ Perhaps a site screening visit

Energy Assessments

What Others Can Do



⌘ What can you expect from an initial utility consumption review?

- ☑ Errors

- ☑ Correct tariff

- ☑ Outstanding features

- ☑ Graphs of energy, demand and cost

Detailed Assessment



- ⌘ Additional site visit(s)
- ⌘ Extensive data gathering, perhaps with dataloggers recording data for week or more

Detailed Assessment



- ⌘ What should you expect?
- ⌘ Formal, technical report whose heart is projects recommended for implementation
 - ☑ To save money
 - ☑ To save energy
 - ☑ To decrease emissions

Detailed Assessment



⌘ Project descriptions

- ☑ Individual, for each project
- ☑ Calculations intelligible to your technical staff
- ☑ Detailed cost, energy, demand and emissions calculations

⌘ Beware the 10% disease

Detailed Assessment



⌘ Implementation information

- ☑ Conceptual design
- ☑ Sufficiently detailed for budget decisions
- ☑ Information about utility rebates if available

⌘ Financial analysis

An Energy Analysis of Your System

⌘ What you can do to make your system cost less to operate

- ☑ Take advantage of Best Practices

- ☑ Look at subsystems as whole

- ☑ Implement some obvious projects

⌘ What others (particularly consultants, but also vendors and utility reps) can do to help make your system cost less to operate

Energy Analysis Resources

☒ DOE

☒ <http://www.oit.doe.gov/bestpractices/>

- http://www.oit.doe.gov/bestpractices/software_tools

☒ <http://www.oit.doe.gov/chemicals/bp>

☒ <http://www.oit.doe.gov/petroleum/bp>

☒ <http://oipea-www.rutgers.edu>

- http://oipea-www.rutgers.edu/documents/doc_m

☒ Texas A&M University IAC

☒ <http://www.mengr.tamu.edu/links/IAC/index.html>

☒ wheffington@mengr.tamu.edu

☒ jim@esl.tamu.edu